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Sabyasachi Tripathi

Department of Economics, Lovely Professional University

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Does Higher level of Education Reduce Poverty and Increase Inequality? Evidence from Urban India

Dr. Sabyasachi Tripathi
Assistant Professor
Department of Economics
Lovely Professional University
Email: sabya.tripathi@gmail.com

Abstract:

By considering India's 52 large urban agglomerations, this paper finds the relationship between higher level of education and poverty and inequality in urban India. Besides using city level education data from University Grants commission (UGC), the study uses two rounds of National Sample Survey (NSS) unit-level data on "consumption expenditure," and "employment and unemployment" for the year 2011-12. An empirical analysis using OLS regression method has shown that city level education, proxied by city-wise total number of PhD students enrolled in the universities, has a negative impact on city level poverty rate as seen by poverty head-count ratio, poverty gap ratio, and squared poverty gap ratio. On the other hand, city level education has a positive impact on city level inequality. City-wise work force participation rate has a negative effect on city poverty rate. The article suggests that we need appropriate city level policy to promote higher level education for reduction in city level inequality and poverty rate for sustainable urban development in India.

Key Words: Level of higher education, large agglomerations, poverty, inequality and Urban India

JEL Classification: I25, R13, I32

I. Introduction

Finding innovative methods for reduction of poverty and inequality is one of the forefront research areas in economics. There are ample evidences to show that the university system has contributed to the innovative capacity of the country over the years. There are several mechanisms through which universities spur regional innovation activity which may lead to reduction of poverty and inequality. First, university education adds to the existing regional human capital; second, universities play a significant role in attracting financial resources into the region; and research in universities will have spillovers on the regional innovation system either by bringing in new scientific knowledge or by facilitating the access to this knowledge through a wider research network of university inventors. With respect to localization of knowledge diffusion, universities have long been considered important institutions both in national and regional innovation systems (Lundvall, 1992; Nelson, 1993; Saxenian, 1985; Saxenian, 1994; Jaffe, 1989; Cowan and Zinovyeva, 2007). Several Indian studies, for example, Datta and Saad (2011) have found that the Indian innovation system notwithstanding, there is evidence to show that the university system has contributed to the innovative capacity of India over the years, albeit in ways that are not reflected through conventional measures of innovation. Torjman and Leviten-Reid (2003) examine the theme of innovation as it relates to the goal of poverty reduction. Thapa (2013) established the link between income poverty and different levels of education in the context of Nepal. Author found that level of educational attainment is positively related with level of income. Hall and Howell-Moroney (2012) studied the relationship between poverty and capacity for innovation in the U.S. states and combined effects of poverty and innovation capacity on U.S. state economic output and employment. They found that a negative indirect effect of socio-economic need (poverty) on human and U.S. state and local financial innovation capacity, though there is no empirical link between poverty and federal financial capacity. In addition to that, they found no statistically significant evidence of the contemporaneous effect of poverty on state economic performance, holding innovation capacity constant. This suggests that poverty primarily affects state economic performance indirectly through reduction of innovation capacity.

In this perspective, the present paper tries to understand how city level education system increases city level innovation for reduction in level of poverty and inequality in urban India. For the analysis, the study uses 52 selected large cities (or agglomerations) in India as the sample.

The reasons behind consideration of these 52 cities are the following: due to city level data constrain, we use the city districts (district where the cities belongs) is used as a proxy. Therefore, large cities stand as good proxy as it covers a large portion of a district than small city. Given the limited availability of data to measure city level innovation, the study uses three proxy variables, i.e., city-wise number of universities, city city-wise total number of PhD students enrolled in the universities, and city-wise total number of students enrolled in the universities. The data has been sourced from the reports of University Grants commission (UGC).¹

Rest of the paper is organized as follows. Section 2 provides measurement of select Poverty and Inequality Indices at the City Level. Section 3 estimates the determinants of poverty and inequality in large cities in India. Finally, section 4 highlights the major conclusions and policy implications.

II. Measurement of select Poverty and Inequality Indices at the City Level

Gini coefficient is used to measure the city level inequality. On the other hand, Poverty Head-count Ratio (PHR), the Poverty Gap Ratio (PGR), and the Squared Poverty Gap Ratio (SPGR) are used to measure the city level poverty. The importance of using these three measurements of poverty is well discussed in Foster et al. (1984) and Ravallion (2004).

2.1 Data used

The urban monthly per capita consumer expenditure (MPCE) data from the 68th Round of the National Sample Survey (NSS) 2011-12 is used to estimate city level consumption poverty and inequality level. We use MPCE data as income data is not available in India from the public domain. The 68th Round on consumption expenditure survey considers the Uniform Recall Period (URP), Mixed Recall Period (MRP) and Modified Recall Period (MMRP).² Rangarajan committee recommended poverty line (the recent most poverty line in India) is used to estimate

¹ The University Grants Commission (UGC) of India is a statutory organization set up by the Union government in 1956, charged with coordination, determination and maintenance of standards of university education. It provides recognition to universities in India, and disburses funds to such recognized universities and colleges. Website address: www.ugc.ac.in/

² The details of URP, MRP and MMRP based estimations are available from National Sample Survey.

the urban poverty. Due to unavailability of city specific poverty line, state (where the city is located) is considered. Finally, MMRP based estimate is used as it captures the low frequency items of purchase of the poor households than MRP and URP.

2.2 Status of Poverty and Inequality at the city Level

The Gini Coefficients for 52 large city districts are presented in Appendix Table 3. Lower values of Gini coefficient are observed for the districts of Moradabad, Aurangabad, Ranchi, Jodhpur, and Salem than for the other districts considered. In contrast, the districts that have registered a higher value of Gini coefficient are Allahabad, Ernakulam, Bhopal, Durg and Thiruvananthapuram. In addition, the standard errors for these estimates are small; thus inequality in the urban areas, as measured by the Gini coefficient, is statistically the highest for Allahabad district and the lowest for Moradabad district across districts.

The calculated values of PHR (see Appendix Table 3) show that the five city districts of Aurangabad, Nasik, Khordha, Solapur, and Allahabad occupy top ranks in descending order for higher urban poverty levels. On the other hand, the five city districts of Bangalore, Thiruvananthapuram, Mumbai, Kota, and Chennai are at the lower end in descending order with regard to increase in poverty level. The calculated values of PGR show that among the 52 city districts under study, the districts of Aurangabad, Nasik, Solapur, Khordha and Bardhaman have high levels of abject poverty. In contrast, the districts of Bangalore, Thiruvananthapuram, Mumbai, Chennai, and Kolkata have comparatively low levels of poverty. The calculated values of SPGR show that the poverty level is low in Bangalore, Mumbai, Chennai, Jodhpur, and Thiruvananthapuram compared to Aurangabad, Nashik, Khordha, Solapur, and Kozhikode. Poverty level of Bangalore is the lowest among 52 large city districts as per the PHR, PGR, and SPGR. On the other hand, Aurangabad and Nashik have the highest and second highest levels of poverty, respectively, among the 52 large city districts as per the PHR, PGR, and SPGR. However, the other 49 city districts (except Bangalore, Aurangabad, and Nashik) occupy different ranks (or different levels of poverty) according to the values of the PHR, PGR, and SPGR. For that reason, the Spearman's rank correlation coefficients (or Spearman's rho) have been calculated to examine the changing relative ranks of cities by the PHR, PGR, and SPGR. The results do not indicate any remarkable change in relative ranking by PHR, PGR, and SPGR.

Therefore, if a city shows a higher urban poverty level than others by the calculated values of the PHR, the calculated values of PGR and SPGR would also be identical.

It has also been observed that by and large, the districts with a lower mean MPCE have higher poverty levels. For instance, the districts of Aurangabad, Khordha, Solapur, and Allahabad have a high level of poverty with a low level of mean MPCE.

III. Framework for the Estimation of Determinants of poverty and inequality in large cities in India

In Sections 2, the level of poverty and the extent of inequality in each city (proxied for the district) are measured. Also estimated in this section are the economic determinants of poverty and inequality.

3.1 Framework for Estimation of Determinants of Urban Poverty

By considering Le (2010), we use the following regression equation model to find the determinants of urban poverty.

$$P_i = \alpha_{00} + \alpha_{11}X_{11} + \alpha_{22}X_{22} + \alpha_{33}X_{33} + u_{11} \quad \text{----- (1)}$$

P_i is the poverty head-count ratio of a city; X_{11} refers to the city level innovation; X_{22} stands for the city level work force participation rate; and X_{33} refers to the city level inequality. Most importantly, to measure city level innovation the study uses the following three proxy variables: First, city-wise total number of PhD student enrolled in the universities, second, city-wise number of universities, and city-wise number of student enrolled in the universities. Equation (1) has been estimated based on the technique of OLS.

3.2 Framework for Estimation of Determinants of Urban Inequality

The following regression equation model has been used to find the determinants of urban inequality. The regression model is followed from Glaeser, *et al.* (2009).

$$G_i = \alpha_0 + \alpha_1X_1 + \alpha_2X_2 + \alpha_3X_3 + u_1 \quad \text{----- (2)}$$

G_i is Gini coefficient value of a city; X_1 refers to city level innovation which is measured by city-wise number of student enrolled in the universities; X_2 stands for the city-wise work force

participation rate; and X_3 refers to the city poverty rate which is measured by city level poverty headcount ratio, poverty gap ratio and squared poverty gap ratio. Equation (2) has been estimated based on the technique of OLS.

3.3 Measurement of Variables and Data Sources

Appendix 1 summarizes the descriptions, measurements, and data sources of all the variables used in the OLS estimation of Equations (1) and (2).

3.4 Description of data

Appendix Table 1 presents the means, standard deviations, minimum, and maximum values for the sample used in regression analysis. Appendix Table 2 reports the sample correlation coefficients of the variables used in the regression analysis. The values of the correlation coefficients show a higher degree of positive correlation, i.e. 0.72 between the city-wise number of universities and city-wise number of PhD student enrolled; 0.96 between city poverty gap ratio and city poverty headcount ratio; and 0.23 between city level inequality and city-wise number of student enrolled in the universities. On the other hand, higher levels of negative correlations are observed, i.e. -0.40 between city poverty rate and city level work force participation rate; -0.22 between , the city poverty rate and city-wise number of universities; and -0.15 between city level squared poverty gap ratio and city-wise number of universities. However, the values of correlations between the independent variables do not show the presence of multi-collinearity.

3.5 Results of the Estimation

Table 1 summarizes the key results from the OLS regression estimation of the determinants of urban poverty, based on Equation (1) with robust standard errors in parentheses (to correct for heteroskedasticity).

Table 1: Determinants of level of poverty in large agglomerations in India

	Dependent Variables								
	<u>City-wise poverty headcount ratio</u>			<u>City-wise poverty gap ratio</u>			<u>City-wise squared poverty gap ratio</u>		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
City-wise total no. of PhD students enrolled in the universities	-0.291*** (0.125)			-0.869*** (0.359)			-0.341*** (0.140)		
City-wise no. of universities		-0.922 (0.872)			-0.213 (0.292)			-0.084 (0.114)	
City-wise no. of students enrolled in the universities			0.029 (.0517)			(0.012) (0.019)			0.34 (0.722)
City-wise work force participation rate	-1.103*** (0.37)	-1.029*** (0.384)	-1.04*** (0.392)	-0.324*** (0.129)	-0.306*** (0.133)	-0.303** (0.137)	-0.112*** (0.054)	-0.105* (0.055)	-0.105* (0.057)
City-wise level of inequality	-75.68*** (36.95)	-79.43** (39.86)	-89.16*** (40.23)	-19.87 (15.55)	-21.39 (16.48)	-24.28 (16.65)	-6.61 (6.92)	-7.2 (7.25)	-8.18 (7.273)
Intercept	95.81*** (20.37)	94.24*** (21.33)	95.08*** (20.923)	26.15*** (8.63)	25.76*** (8.88)	25.89*** (8.75)	8.99*** (3.84)	8.85*** (3.93)	8.91** (3.89)
No. of Observations	52	52	52	52	52	52	52	52	52
R ²	0.30	0.26	0.24	0.22	0.18	0.18	0.17	0.13	0.13

*Note: Figures in parentheses represent robust standard errors. ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively.*

Source: Estimated using equation (1).

In Regression (1), the result shows that City-wise total number of PhD students enrolled in the universities has a negative and significant effect (at 1 per cent level) on the city level poverty as measured by poverty headcount ratio. The finding supports the expected hypothesis and shows that a 10 per cent increase in City-wise total number of PhD student enrolled in the universities brings down the city level poverty by 2.9 per cent. This finding implies that city level innovation has a negative effect on city level poverty. The results are consistent for the regression results (4) and (7) as well. This indicates that city level innovation has a negative effect on city level poverty as reflected in poverty headcount ratio, poverty gap ratio, and squared poverty gap ratio. On the other hand, regressions (2), (3), (5),(6), (8), and (9) show that other two proxy variables for measuring city level innovation, i.e., City-wise number of university and City-wise number of student enrolled in the universities have no impact on city level poverty, as measured by poverty headcount ratio, poverty gap ratio, and squared poverty gap ratio. This implies that if the number of PhD student increases in a city, there would be higher innovation and reduction in city poverty level.

Regressions (1) to (9) show that city-wise work participation rate also has a negative effect on city poverty rate. For example, Regression (1) shows that 10 % increase in city work participation rate decreases city poverty rate by about 11 %. This result shows that increasing work participation rate increases income of the individual and decreases the city poverty rate. On the other hand, Regressions (1)-(3) show that city level inequality negatively impacts city level poverty. This is quite evident from the recent trend of poverty and inequality in urban India, i.e. the increase in urban inequality and simultaneous decrease in urban poverty.

Table 2 summarizes the key results from the OLS regression estimation of the determinants of urban inequality based on Equations (2) with robust standard errors in parentheses (to correct for heteroskedasticity). The results show that City-wise total number of students enrolled in the universities, which is Proxied for measuring city level innovation level, has a positive effect on city level inequality. Regression (10) shows that a 10 percent increase in city level innovation increases city level inequality by about 4.9 %. The result is consistent for regressions (11) and (12) as well. On the other hand, the results also show that city-wise work participation rate does not have any impact on city level inequality. Finally, the regression results show that city level poverty has a negative impact on city level inequality. This result is consistent with the result

which is presented in Table 1, and indicates that reduction in city level poverty leads to increase in city level inequality.

Table 2: Determinants of level of inequality in large agglomerations in India

	<i>Dependent Variable :City-wise level of inequality</i>		
	(10)	(11)	(12)
City-wise total no. of students enrolled in the universities	0.494** (0.222)	0.509** (0.232)	0.507** (0.237)
City-wise work force participation rate	0.066 (0.174)	0.1089 (0.171)	0.136 (0.170)
City-wise level of poverty head count ratio	-0.109** (0.048)		
City-wise level of poverty gap ratio		-0.256* (0.135)	
City-wise level of squared poverty gap ratio			-0.518 (0.358)
Intercept	0.321*** (0.074)	0.292*** (0.069)	0.277*** (0.068)
No. of Observations	52	52	52
R ²	0.18	0.15	0.13

*Note: Figures in parentheses represent robust standard errors. ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively.*

Source: Estimated using equation (2).

IV. Conclusions

This paper measures the impact of city level higher education on city level poverty and inequality. It also measures the level of the city inequality and poverty to identify determinants of urban inequality and poverty by using the OLS regression estimation. For this analysis, individual level data of NSS 2011-12 on consumer expenditure and employment and unemployment are used by considering 52 large city districts in India. City level education is measured by the three proxy variables, i.e., city-wise number of universities; city-wise total number of PhD students enrolled in the universities, and city-wise total number of students enrolled in the universities. The city level data on university level education is collected from University Grants Commission (UGC) reports.

The empirical exercise shows that city level education has a negative effect on city level poverty rate and a positive effect on city level inequality. The results support the findings of Hall and Howell-Moroney (2012) about the positive effect of innovation on poverty reduction. The results show that education has emerged as an important factor behind higher level of inequality. It is

because of highly educated workers earn more than a person who is having basic education and the differences have grown particularly over the recent decades.³ Therefore, strong policies are needed at the city level to reduce inequality along with reduction of poverty by increasing city level higher education through promoting university education system.

³ <http://ortho-neity.blogspot.in/2009/10/education-inequality-and-poverty.html>

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Appendix

Appendix 1: Variable sources and definitions

Work-force participation rate (WPR): WPR is defined as the number of persons/person-days employed per 1000 persons/person-days. Source: Unit level data of NSS 68th Round on Employment and Unemployment in 2011-12.

City inequality level: Gini coefficient of the large city districts is arrived at by considering urban sample persons of that district. Source: Unit level data of NSS 2011-12 on consumer expenditure.

City wise poverty head count ratio in 2011–2012: To measure city level poverty we use urban sample of a city district. Source: NSS 68th Round on consumption expenditure of 2011–2012.

Appendix Table 1: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
City-wise no. of university (CU)	2.42	2.35	0	10
City-wise no. of student enrolled in the universities (in thousands) (CEU)	18.9	31.2	0	191.2
City-wise total no. of PhD student enrolled in the universities (CPHDEU)	789.35	1530.80	0	9502
City-wise work force participation rate (in %) (CWFP)	37.43	6.12	22.91	50.69
City-wise level of poverty head count ratio (in %) (CPHR)	27.67	18.31	3.80	85.09
City-wise level of poverty gap ratio (in %) (CPGR)	6.88	6.10	0.38	30.48
City-wise level of squared poverty gap ratio (in %) (CSPGR)	2.39	2.44	0.07	12.77
City-wise level of inequality (CGINI)	0.32	0.06	0.18	0.51

Source: Author's computation based on 52 observations.

Appendix Table 2: Correlations between Dependent and Independent Variables

	CU	CEU	CPHDEU	CWFP	CPHR	CPGR	CSPGR	CGINI
CU	1.00							
CEU	0.40	1.00						
CPHDEU	0.72	0.29	1.00					
CWFP	0.14	-0.15	-0.02	1.00				
CPHR	-0.22	0.04	-0.27	-0.40	1.00			
CPGR	-0.17	0.05	-0.24	-0.35	0.96	1.00		
CSPGR	-0.15	0.04	-0.23	-0.30	0.92	0.99	1.00	
CGINI	0.18	0.23	0.12	0.16	-0.34	-0.28	-0.24	1.00

Note: See Appendix Table 1 for variable definitions.

Source: Author's calculations.

Appendix Table 3: Measurement of city level poverty and inequality

City	District	Poverty Headcount Ratio	Poverty Gap Ratio	Squared Poverty Gap Ratio	Gini coefficient
Agra	Agra	72.54	19.62	6.36	0.32
Aligarh	Aligarh	35.56	7.28	2.12	0.33
Allahabad	Allahabad	28.02	9.15	3.45	0.51
Amritsar	Amrithar	27.35	4.63	1.34	0.28
Aurangabad	Aurangabad	85.09	30.48	12.77	0.20
Bangalore	Bangalore	6.84	0.60	0.07	0.37
Asansol	Barddhaman	44.19	13.08	5.11	0.33
Bareilly	Bareilly	49.35	13.36	4.89	0.29
Bhopal	Bhopal	29.13	7.33	2.49	0.43
Chandigarh	Chandigarh	21.51	4.93	1.65	0.38
Chennai (Madras)	Chennai	7.75	1.50	0.38	0.31
Coimbatore	Coimbatore	8.72	1.10	0.27	0.35
Delhi	Delhi	15.71	3.14	0.92	0.35
Dhanbad	Dhanbad	44.44	13.27	4.79	0.28
Hubli-Dharwad	Dharward	49.86	15.80	6.18	0.28
Durg-Bhilainagar	Durg	44.98	14.77	6.81	0.40
Kochi (Cochin)	Eranakulam	8.94	2.04	0.87	0.49
Gwalior	Gwalior	27.75	7.53	2.72	0.38
Hyderabad	Hyderabad	8.38	1.55	0.37	0.28
Indore	Indore	24.87	5.91	1.72	0.30

City	District	Poverty Headcount Ratio	Poverty Gap Ratio	Squared Poverty Gap Ratio	Gini coefficient
Jabalpur	Jabalpur	45.20	13.12	4.73	0.36
Jaipur	Jaipur	9.87	2.62	1.00	0.35
Jalandhar	Jalandhar	19.17	4.44	1.41	0.32
Jodhpur	Jodhpur	11.33	2.56	0.69	0.25
Guwahati (Gauhati)	Kamrup	51.74	12.90	4.00	0.29
Kanpur	Kanpur Nagar	32.63	6.18	2.08	0.29
Bhubaneswar	Khordha	24.18	3.92	1.25	0.35
Kolkata (Calcutta)	Kolkata	9.65	1.11	0.25	0.38
Kota	Kota	38.25	9.61	3.13	0.36
Kozhikode (Calicut)	Kozhikode	15.43	2.14	0.57	0.31
Vijayawada	Krishna	13.67	2.91	0.93	0.30
Lucknow	Lucknow	34.71	8.16	2.56	0.37
Ludhiana	Ludhiana	16.26	4.46	1.61	0.28
Madurai	Madurai	15.31	1.93	0.44	0.30
Meerut	Meerut	31.93	6.88	1.81	0.35
Moradabad	Moradabad	35.64	5.55	1.24	0.18
Mumbai (Bombay)	Mumbai	4.10	0.50	0.12	0.38
Mysore	Mysore	11.30	1.52	0.33	0.31
Nagpur	Nagpur	18.32	4.30	1.70	0.33
Nashik	Nashik	19.95	4.29	1.37	0.28
Patna	Patna	43.53	8.84	2.94	0.31
Pune (Poona)	Pune	9.05	1.89	0.47	0.34
Jamshedpur	Purbi Singhbhum	29.69	5.71	1.67	0.28
Raipur	Raipur	32.55	8.84	3.31	0.38
Ranchi	Ranchi	69.01	21.90	7.88	0.22
Salem	Salem	41.33	8.80	2.93	0.26
Solapur	Solapur	31.05	4.91	1.17	0.28
Bhiwandi	Thane	9.15	1.25	0.35	0.30
Thiruvananthapuram	Thiruvananthapuram	3.80	0.38	0.10	0.39
Tiruchirappalli	Tiruchirappalli	10.99	2.40	0.62	0.28
Varanasi (Benares)	Varanasi	42.14	12.94	5.01	0.32
Visakhapatnam	Visakhapatnam	16.76	3.96	1.20	0.32

Source: Author's calculation using the NSS 68th Round unit level data of the National Sample Survey of 2011-12 in consumer expenditure.